

On-Line Flutter Prediction Tool for Wind Tunnel Flutter Testing using Parameter Varying Estimation Methodology, Phase II

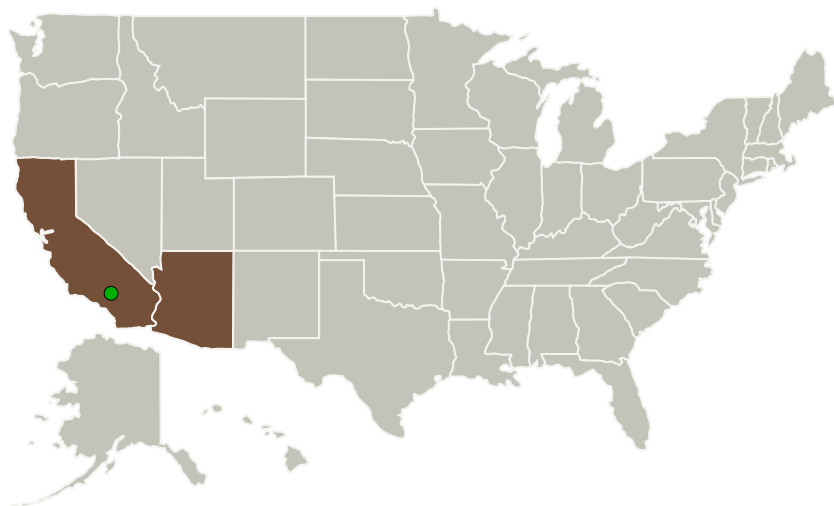
Completed Technology Project (2011 - 2013)



Project Introduction

ZONA Technology, Inc. (ZONA) proposes to develop an on-line flutter prediction tool using the parameter varying estimation (PVE) methodology, called the PVE Toolbox, to ensure the flight safety during the flight flutter test and to prevent the damage to the wind tunnel hardware from the structural failure of the flutter model during wind tunnel flutter test. This tool can be applied to rapidly identify parameters, such as modal damping and frequency from test data measured at pre-flutter flight/wind tunnel conditions, then subsequently to assess the flutter boundary of aircraft/wind tunnel model in real time. In this PVE Toolbox, several system identification techniques are employed to consistently estimate the damping/frequency of the physical modes, followed by the implementation of Zimmerman-Weissenburger flutter margin, damping trends extrapolation, linear parameter varying modeling combined with mu-analysis, and thin plate interpolation method for flutter boundary prediction. Seamlessly integration of the PVE Toolbox into IADS (a real-time flight test data acquisition software system) will significantly improve the on-line flutter prediction capability of the PVE Toolbox. This robust, production-ready, and flight test demonstrated PVE Toolbox will provide flight/wind tunnel test engineers an on-line flutter prediction capability in the control room for decision-making during flight/wind tunnel flutter tests.

Primary U.S. Work Locations and Key Partners



On-Line Flutter Prediction Tool for Wind Tunnel Flutter Testing using Parameter Varying Estimation Methodology, Phase II

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

On-Line Flutter Prediction Tool for Wind Tunnel Flutter Testing using Parameter Varying Estimation Methodology, Phase II

Completed Technology Project (2011 - 2013)



Organizations Performing Work	Role	Type	Location
ZONA Technology, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations

Arizona	California
---------	------------

Project Transitions

**June 2011:** Project Start**September 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139195>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ZONA Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

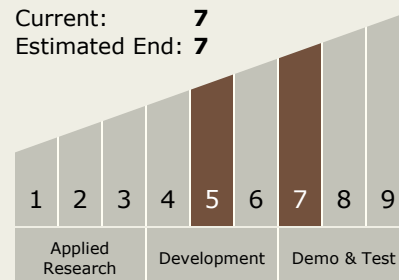
Carlos Torrez

Principal Investigator:

Jie Zeng

Technology Maturity (TRL)

Start: 5
Current: 7
Estimated End: 7



On-Line Flutter Prediction Tool for Wind Tunnel Flutter Testing using Parameter Varying Estimation Methodology, Phase II

Completed Technology Project (2011 - 2013)



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.3 Aeroelasticity

Target Destinations

The Moon, Mars, Outside the
Solar System, The Sun, Earth,
Others Inside the Solar System